

ART. XI.—*The Staurograptus Bed of Victoria.*

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(With Plate IX.)

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Messrs. W. J. Harris and W. Crawford recently found some dendroid graptolites of considerable importance to Victorian Ordovician stratigraphy, in a band of slate on the bank of a creek 3 miles north east of Romsey. The band contains the genus *Staurograptus*, and we regard it as being very near the base of the Lower Ordovician. The band (approximately 27 chains, N.18°W. from the south-west corner of Allot. 26, Parish of Springfield, on a water reserve), is of hard, black slate intercalated with bands of chert, quartzite, and altered sandstone. A note on Quarter Sheet 5 SE. refers to the outcrop as "black shales." The strike is almost north and south and dip 86° west. Easterly up the creek is an outcrop of quartz-porphry.¹ Still further east shales, mudstones and sandstones occur, lithologically similar to those outcropping in typical Silurian areas.²

Only two graptolite genera, viz. *Staurograptus* and *Dictyonema*, have been recognised, in both cases preserved as films on the bedding planes of the slate, but in profusion. *Staurograptus* is a new record for Victoria; *Dictyonema* has been found at several localities, more particularly at Taylor's Quarry, 5 miles to the north. There *D. macgillivrayi* T. S. Hall, *D. pulchellum* T. S. Hall, and *D. grande* T. S. Hall, occur with *Bryograptus*, *Clonograptus*, *Tetragraptus*, etc.

Genus *Staurograptus* Emmons.

STAUROGRAPTUS DIFFISSUS, sp. nov.

(Plate IX., Figs. 1-5.)

Polypary broadly conical to saucer shaped; usually vertically compressed. Sicular long, conical, suspended by a long nema; no primary disc observed.

The primary theca grows beyond the aperture of the sicular; the polypary begins with four or more branches.

Polypary small, in cyathiform aspect less than 1.5 cm. wide distally, in vertically compressed aspect (apparently less mature forms) not exceeding 1 cm. It develops by dichotomy to approxi-

1.—This is shown on the Quarter Sheet as "greenstone," and was probably presumed to belong to the diabases of which the hills to the north are largely composed. It is an acid dyke similar to those found further south.

2.—Professor Skeats, however, has described these as Heathcotean eastwards up to the Basalt junction. Pan-Pacific Sci. Congress, Australia, Melb. Handbook, p. 134, 1923; reprinted in Proc. Pan-Pac. Sci. Cong., Aust. 1923, ii., p. 1667, 1925.

mately 16 branches of the fourth order; none of our forms seems to have developed further.

Branches slender, about 0.25 mm. wide, all the branches slightly flexuous, branching at irregular intervals. In the horizontally compressed polypary the branches of the third order diverge at an average angle of 45° .

Thecae number from 20 to 25 in 10 mm., in contact for one-third of their length, outer wall straight or slightly concave, apertural margin slightly concave. Ventral margin makes, with the axis of branch, an angle of about 40° .

Remarks.—The nema of the mature forms is about 7.0 mm. in length, and is often split, giving the appearance of a double nema, bifurcating at different distances from the sicula. In one instance the strands of the nema are twisted around each other below the sicula, but reunite and apparently form a single tube at a still lower level. Except as regards size, the vertically compressed polypary bears a considerable resemblance to *S. dichotomous* Emmons. It differs, however, from that species in the angles of bifurcation and the details of its thecae. In the cyathiform aspect the typical nema is readily recognised.

Associates.—*Dictyonema scitulum*, sp. nov., *D. campanulatum*, sp. nov., and Crustaceae.

Genus *Dictyonema* Eichwald.

DICTYONEMA CAMPANULATUM, sp. nov.

(Plate X., Figs. 6-13.)

Polypary cyathiform, flabelliformly compressed in mature specimens, attaining a length of approximately 1.2 cm. and a width of 1.5 cm. Branches irregularly disposed, somewhat flexuous; outside branches convex to the axis of the polypary proximally, approximately straight distally, inside branches flexuous throughout. Bifurcations fairly frequent. Branches from 0.3 to 0.4 mm. wide of increasing width, 10 with interspaces in a width of 10 mm., space between the branches more than the width of the branches. Stout transverse dissepiments 1.0 mm. to 2.0 mm. apart, which, with the adjacent branches enclose an irregularly shaped interspace.

Thecae 12-14 in 10 mm., acutely dentiform.

Sicula about 0.7 mm. long with long attenuated nema.

Remarks.—The material on which this description is based cannot be regarded as ideal. Nevertheless there is little doubt regarding the distinctness of *D. campanulatum* from any other form known to us.

Some specimens (Pl. IX., Figs. 7, 8, 10, 12, 13) show curious double or triple nemas, hair-like filaments, one of which occasionally ends in a small triangular body suggestive of a peduncular attachment.

Associates.—*Staurograptus diffissus*, sp. nov., and *D. scitulum*, sp. nov. Crustaceae.

DICTYONEMA SCITULUM, sp. nov.

(Plate IX., Figs. 14-19.)

Polypary cyathiform, flabelliformly compressed, in mature specimens attaining a length of 2 cm., a width distally of about 2 cm. (included in an angle of 85°).

Branches nearly parallel, regularly disposed, outer ones slightly concave to axis of polypary proximally, and straight distally, inner ones straight throughout. Bifurcations infrequent. Branches 0.4 mm. (0.4-0.5 mm.) wide, of constant width, 13-14 occupying (with interspaces) a width of 10 mm. The spaces between the branches is somewhat less than the width of the branches. Comparatively stout transverse dissepiments, from 0.7 mm. to 1.5 mm. wide, connect the branches and these with the branches enclose a subrectangular interspace. Thecae 14-17 in 10 mm. distally. Thecal apertures thickened and acutely dentiform.

Sicula 1 mm. long.

Remarks.—The type specimen, although preserved as a film, exhibits some of the characteristics revealed by Wiman (1), Bulman (2) and others in their work of isolation of specimens in relief from matrices with dilute acids.

Two types of thecae may be recognised, the thecae and "gonangia" of Wiman (1). The latter arise from opposite sides of the former and throughout their short length appear to be disposed in alternately right and left hand spirals, their apertures being opposed. The apertures are visibly thickened. An attempt was made to trace some plan of arrangement of the cell groups about the branches, but, other than that indicated, unsuccessfully.

The dissepiments are straight bars connecting adjacent branches and show no evidence of fusion midway. An apertural process, very similar to that described by Ruedemann in regard to the thecae of *D. furciferum* (3, p. 607), extends from the flattened aperture of the "gonangium" and impinges on the dorsal part of the adjoining branch.

There is little doubt that *D. scitulum*, sp. nov. is closely related to *D. furciferum*, but unfortunately the thecae of the type specimen are not clearly enough shown to ascertain whether the difference is varietal or specific. On the other hand, Ruedemann (3, pl. iii., f. 11) has only figured a portion of a polypary, and until better material is forthcoming, it has been thought desirable, on account of its stratigraphical importance in Victoria, to give *D. scitulum* specific rank.

Associates.—*Staurograptus diffissus*, sp. nov. and *D. campulatum*, sp. nov. Crustaceae.

Correlation of Fauna.

The importance of the Springfield association to the Victorian Ordovician sequence lies in the facts that it is the oldest graptolite

fauna yet discovered in Australia, and is comparable with the oldest but one of the graptolite associations of America and Europe. The graptolite succession is generally alike in all parts of the world and the forms described in this contribution are so closely related to those found in similar associations elsewhere that there is little doubt that the Springfield slates are very near to the base of the Ordovician. Making world-wide comparisons, stratigraphically above them should occur a fauna equivalent to that of the American Deep Kill Zone III, containing *Clonograptus flexilis* and *Tetragraptus* (4, p. 130); such a position and association is held by the Taylor's Quarry slates east of Lancefield (5, p. 175).

If conditions were suitable to its preservation and it is accessible, a bed containing exclusively a *Dictyonema* allied to *D. flabeliforme* Eich. should yet be found in Victoria stratigraphically below the Springfield slates. This bed in other parts was formerly regarded as marking the closing stage of the Cambrian, but latterly both in American and Europe, it has been recognised as introducing the extensive Ordovician transgression. Such is probably the case in Victoria, for stratigraphically above the Springfield slates we have a very comprehensive suite of Lower Ordovician graptolites which have been zoned and subzoned, while, apparently, stratigraphically below them a little east of their strike some distance north we have the Cambrian *Dinesus* trilobite fauna. It is probably in this direction that the missing bed will be found.

Bibliography.

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4. R. RUEDEMANN. Paleontologic Contributions from the New York State. *Mus. and Sci. Dept. Bulls.* 227, 228, 1919.
5. T. S. HALL. The Graptolites of the Lancefield Beds. *Proc. Roy. Soc. Vic.*, n.s., xi. (2), 1899.

EXPLANATION OF PLATE IX.

All Figures $\times 2.6$.

Figs. 1-5.—*Staurograptus diffissus*, sp. nov.

1. Young polypary showing sicula and nema. Paratype.
2. Polypary vertically compressed. Paratype.
3. Polypary laterally compressed. Paratype.
4. Polypary vertically compressed. Paratype.
5. Polypary vertically compressed. Holotype.

